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METHOD AND SYSTEM TO CREATE A CIRCULATION OF A LIQUID IN A TUBE SYSTEM

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METHOD AND SYSTEM TO CREATE A CIRCULATION OF A LIQUID IN A TUBE SYSTEM

[Verfahren und Anlage zum Schaffen einer Zirkulation von Flüssigkeit in einem Rohrsystem]

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The following information has been taken from documentation submitted by the applicant.

Description

The invention pertains to a method to create a circulation of a liquid in a tube system, according to such method a liquid is caused to circulate in a flow tube, said tube having at least two tubes inside each other, whereby the liquid flows through one of the tubes inside each other in the vicinity of the end of the flow tube, and flows back through the other one, and the liquid during the circulation is caused to flow through the outer tube to the end of the flow tube and to flow back through the inner tube.

Furthermore, the invention also pertains to a system to create a circulation of liquid, said system having a flow tube with at least two tubes inside each other and a pump, by means of which

the liquid is caused to flow through one of the tubes inside each other in the vicinity of the end of the flow tube, and to flow back through the other one, whereby the pump is positioned so as to set the liquid into circulation in such a manner that the liquid flows through the outer tube to the end of the flow tube and back through the inner tube.

After opening of a warm water faucet or a shower stopcock, in practice it is necessary to let the water flow directly into the drain, until water at the desired heat is obtained by the consumer. The volume of water allowed to run into the drain is in practice as long as the referenced tube branch, because the warm water in the tube branch with the stopcock closed will cool off and loose its heat to the environment. Therefore, its use is inconvenient, and in addition to the lost water, thermal energy from the water is also lost. In addition, the energy needed to heat the water is lost because warm water will remain in the tube after closing the stopcock and will cool off.

Patent Specification DE 35 08 874 discloses one solution in which two tubes are placed one inside the other in a tube branch and a circulating pump is mounted in conjunction with the inner tube, said pump sets the water in the tube to circulate, and specifically in that it pumps warm water through the inner tube in the vicinity of the stopcock. The return of the circulating water takes place through the outer tube. When opening the stopcock, however, the direction of flow of the water in the outer tube changes, which means that any impurities on the inner surface of the tube will detach with the water. In addition, the water will cool off somewhat when the warm water first flows through the inner tube, and then flows back through the outer tube. When opening the stopcock again, first some cooled water will flow from the stopcock, and only after all water has flowed out from the tube branch will fully warmed water arrive. Therefore, in this case it is necessary that water be lost, or at least the variable temperatures will necessarily result in some inconvenience. In addition, the design disclosed in this DE publication is very difficult from a construction point of view.

Patent specification DE 34 03 859 discloses a solution in which water is made to circulate in a master tube by means of a pump. However, according to this design it is not possible to cause water to circulate in junction lines between the master tube and the consumer sites, and problems of energy loss and low convenience are significant, in particular when the junction lines are relatively long. The design according to publication DE 34 03 859 also has a complicated design.

This invention is based on the problem of creating a method and a device that will avoid the disadvantages mentioned above.

Therefore, the invented method is characterized in that the flow tube is a junction line that is positioned to extend from distributors so that warm water is directed from a warm water distributor through the outer tube and the back-flowing circulation water is directed through the inner tube to a circulation water distributor.

In addition, the system according to the invention is characterized in that the flow tube is a junction line and that the system has at least one warm water distributor and at least one circulation water distributor, whereby the junction line is positioned to extend from the referenced distributors so that the outer tube extends from the warm water distributor and the inner tube is connected with the circulation water distributor.

The essential idea of the invention is that two tubes are located one inside the other in order to form a flow tube, and that liquid in the flow tube is caused to circulate so that the liquid is guided through the outer tube toward the end of the flow tube, and the return from the end of the flow tube takes place through the inner tube. The idea of one preferred design embodiment is that the outer tube is connected to a warm water distributor and the inner tube is connected to a circulation water distributor, and that thereby a circulation is created such that water is sucked with a pump from the circulation water distributor. The idea of another preferred design embodiment is that a valve is provided at the end of the circulation tube at the circulation water distributor to regulate the flow volume of the circulation water.

The advantage of the invention is that water at a desired warmth is obtained from a consumer site essentially immediately after opening the stopcock, which reduces the consumption of both water and energy and makes its use more convenient. In addition, the water flows in the flow tube primarily in the same direction the entire time. The temperature of the back flowing water can also not drop significantly with a very small circulation flow, when the back flow occurs through the inner tube. By connecting the two tubes located inside each other that form the flow tube, with the corresponding distributors, the design can be implemented easily and in a favorable manner, and at the same time it is possible to set the water to circulate out to the consumer sites at the ends of the junction lines.

The invention will be described in greater detail below with reference to the attached figures. We have:

Figure 1 A system diagram relevant for the design according to this invention,

Figure 2 The end of a flow tube of the system according to Figure 1, shown schematically from the front and in cross section, and

Figure 3 The schematic design of distributors in the system according to Figure 1.

Figure 1 shows a schematic of the water distribution system. Water is directed into the system through an inlet tube 1. A portion of the water coming through the inlet tube 1 is directed to a boiler 2 in order to be heated. A portion of the water is, in turn, sent through a cold water tube 3 through a cold water distributor 4 to the consumer sites 5. An additional portion of the water is sent directly to a mixing valve 6 that takes water either from the boiler 2, the inlet tube 1 or the circulation water, so that the water flowing from the mixing valve 6 through a warm water tube 7 is sufficiently warm, typically above 50°C. The heated water is sent through the warm water tube 7 to

the warm water distributors 8. A circulation water distributor 9 is located in the same area as a warm water distributor 8 and a cold water distributor 4, said area is indicated by a dashed line in Figure 1. A circulation water tube 10 leads from the circulation water distributor 9 to the mixing valve 6. A pump 11 is located in the circulation water tube 10.

A junction line designed as a double tube 12 leads from the warm water distributor 8 and circulation water distributor 9 to the consumer site 5. The consumer site 5 can be a stopcock or a shower, or any other appropriate consumer site. In addition, of course, the number of consumer sites 5 can be varied as needed. The double tube 12 consists of two tubes one inside the other, so that the warm water flowing from the warm water distributor 8 through the warm water tube 7 will flow through the outer tube of the double tube. Water will be sucked through the inner tube of the double tube 12 by means of the pump 11 into the circulating water distributor 9, and from there, through the circulation water tube 10 to the mixing valve 6. In this case, the pump 11 causes water in the double tubes 12 to circulate, and warm water will circulate in the vicinity of each consumer site 5, whereby warm water is available immediately, water will be saved and the consumer convenience improved. The double tube 12 can at the same time be mounted with the other tubes. Pressure tightness is not needed by the inner tube of the double tube 12, because the pressure inside and outside of it is essentially the same and the wall of the inner tube can thus even be very thin. A rupture of the inner tube of the double tube will not cause any water damage, but rather only a disturbance in the circulation.

Harmful bacterial, such as Legionella bacteria, typically live in a temperature of 15-40°C. During the constant circulation of the water, the rate of flow can be easily adapted so that the water temperature will not drop too much, for example, below 50°C, so that the survival of harmful bacteria will be eliminated.

Of course, distributors can be located at several different sites, according to need, and the distribution line system to them can also be varied according to need. In the case of Figure 1, various distributors are shown twice, and line control valves 13 are provided in the circulation water tubes 10 to regulate the desired rate of flow. Blocking valves 20 are located in the warm water tubes 7. For simplicity, in Figure 1 only the junction lines emanating from the one distributor to the consumption sites 5 are shown. At the end of the circulation tube above the double tube 12 that is located at the circulation water distributor 9, there are control valves 14 that are used to control the flow of the circulation water in the double tubes 12 as desired. Due to the proper dimensioning and control of the control valves 14 and of the pump 11, it can be assured that not too much water will go to the return when opening the stopcock of the consumer site 5, but rather that at the consumer site 5 warm water will be available in sufficient quantity and under sufficient pressure. The control valve 14 can also be equipped with an automatic system that recognizes the opening of the stopcock at the consumer site 5, for example, by a drop in the water pressure within

the double tube 12, and then closes the valve 14, which prevents the circulation when opening the stopcock.

Figure 2 shows one detail of the end of the junction line. At the end of the junction line there is a wall socket 15, for example. The outer tube 16 of the double tube 12 is a flow tube and the inner tube 17 is a circulating tube. With the stopcock closed, the water will circulate according to the arrows. In this case, the design will operate according to the counterflow principle, and when the circulation volume is small again, the temperature of the back flow water will not drop too much. When opening the stopcock, at least the majority of the water will flow to the wall socket 15, whereby the water in the flow tube 16 will then flow the entire time in the same direction. If it is desired, a protective tube 18 can be placed around the double tube 12.

Figure 3 shows one detail of the environment of the warm water distributor 8 and of the circulation water distributor 9. The circulation tube 17 can be located within a flow tube 16, for example, by means of an angle coupling 19 shown in the figure. The double tube 12 extends from the one end of the angle coupling 19, and the warm water distributor 8--from which the warm water is guided into the outer flow tube 16--is located at the other end of the angle coupling 19. The circulation water distributor 9, in turn, is located at the angle of the angle coupling 19, and consequently, the circulation tube 17 can be mounted and connected in order to extend in the middle of the circulation tube 16 and of the part of the angle coupling 19 located at the double tube. It is also easy to attach a control valve 14 to the angle coupling 19. The circulation tube 17 within the flow tube 16 is shown by broken lines in Figure 3.

The figures and the associated description are intended only to illustrate the idea of the invention. As regards the details, the invention can be varied within the framework of the patent claims. For example, the invention can be modified for floor heating in such a manner that an input tube and a return tube can be placed inside each other and the end of the outer tube can be connected to a tap. Likewise, a corresponding system can also be used for systems to keep outside areas unfrozen. For heating applications, for example, the liquid according to the invention can be, e.g., a water-glycol mixture or a salt solution. One purpose of the application is to prevent the freezing of the cold water line, in that the circulation tube is installed in the cold water line. An application of this kind is capable of keeping a rather long water tube unfrozen with a pump with very small power. A pump of even 50 W would be enough to allow a sufficient circulation of water, e.g., within a 100 m long water tube. The invention can also be used outside of a building for heating systems and for warm water tube systems, where a circulation is required. By means of the invented design it is possible to create an insulated tube with a relatively small outside diameter, i.e., to save significant amounts of insulating material and to keep the outside diameter of the insulated unit as a whole relatively small.

Claims

1. Method to create a circulation of a liquid in a tube system, according to such method a liquid is caused to circulate in a flow tube, said tube having at least two tubes (16, 17) inside each other, whereby the liquid flows through one of the tubes (16, 17) inside each other in the vicinity of the end of the flow tube, and flows back through the other one, and the liquid during the circulation is caused to flow through the outer tube (17) to the end of the flow tube and to flow back through the inner tube (17), characterized in that the flow tube is a junction line that is positioned to extend from distributors (8, 9) so that warm water is directed from a warm water distributor (8) through the outer tube (16) and the back-flowing circulation water is directed through the inner tube (17) to a circulation water distributor (9).

2. Method according to Claim 1, characterized in that the flow quantity of the inner tube (17) is regulated with a valve (14).

3. Method according to Claim 2, characterized in that when opening a stopcock at a consumer site (5) at the end of the junction line, the flow in the inner tube (17) is stopped.

4. Method according to one of the preceding claims, characterized in that the circulation is caused by suction of liquid through the inner tube (17).

5. System to create a circulation of liquid, said system having a flow tube with at least two tubes (16, 17) inside each other and a pump (11), by means of which the liquid is caused to flow through one of the tubes (16, 17) inside each other in the vicinity of the end of the flow tube, and to flow back through the other one, whereby the pump (11) is positioned so as to set the liquid into circulation in such a manner that the liquid flows through the outer tube (16) to the end of the flow tube and back through the inner tube (17), characterized in that the flow tube is a junction line and that the system has at least one warm water distributor (8) and at least one circulation water distributor (9), whereby the junction line is positioned to extend from the referenced distributors (8, 9) so that the outer tube (16) extends from the warm water distributor (8) and the inner tube (17) is connected with the circulation water distributor (9).

6. System according to Claim 5, characterized in that the system has an angle coupling (19) to bring the outer tube (16) and the inner tube (17) into each other, whereby the outer tube (16) is connected to the one end of the angle coupling (19) and the inner tube (17) is connected to the angle and the tubes (16, 17) are connected in each other at the other end.

7. System according to Claim 5 or 6, characterized in that the system has a valve (14) to regulate the flow quantity in the inner tube (17).

8. System according to one of Claims 5-8, characterized in that the pump (11) is positioned so as to suck liquid through the inner tube (17).

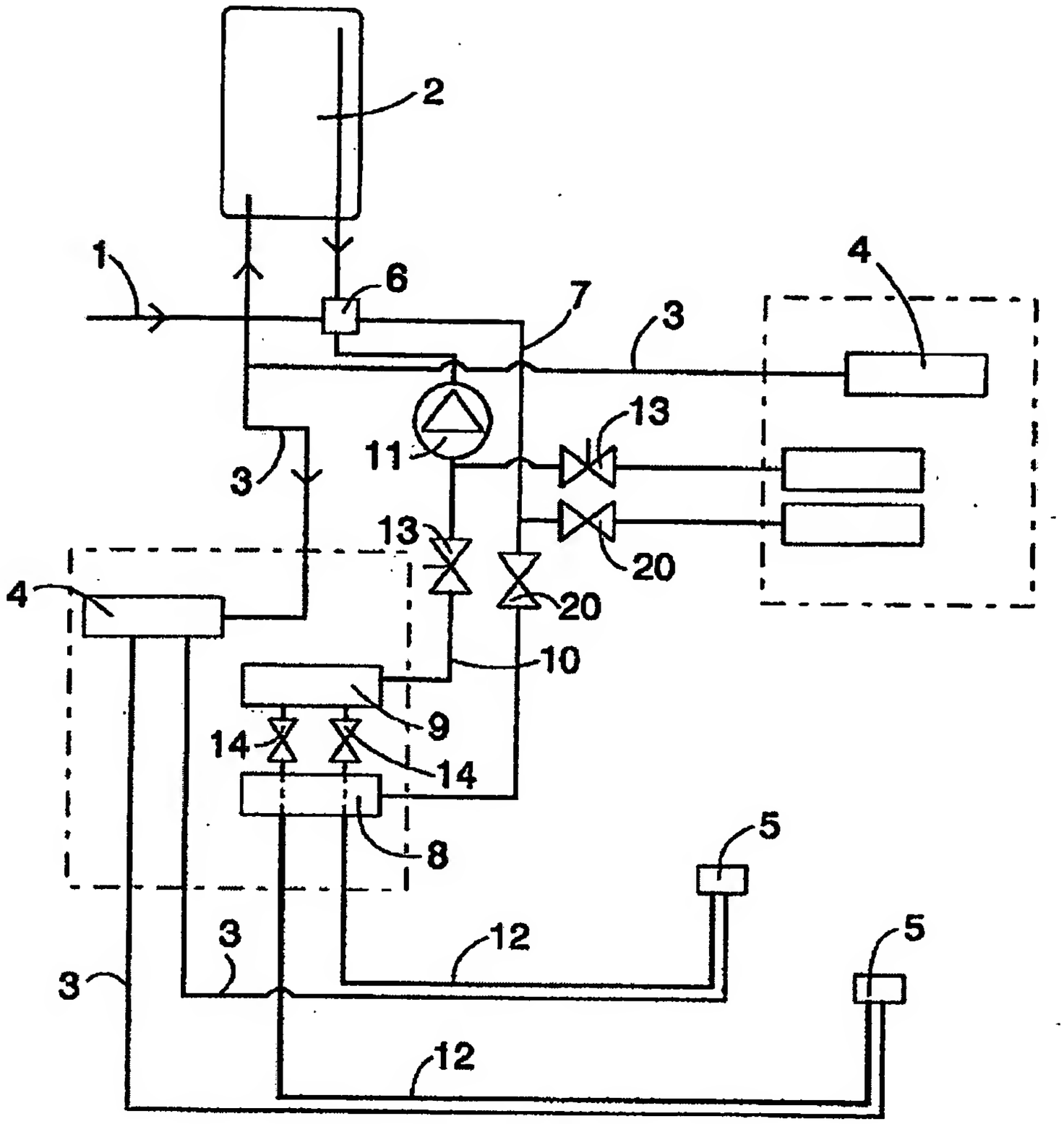

FIG. 1

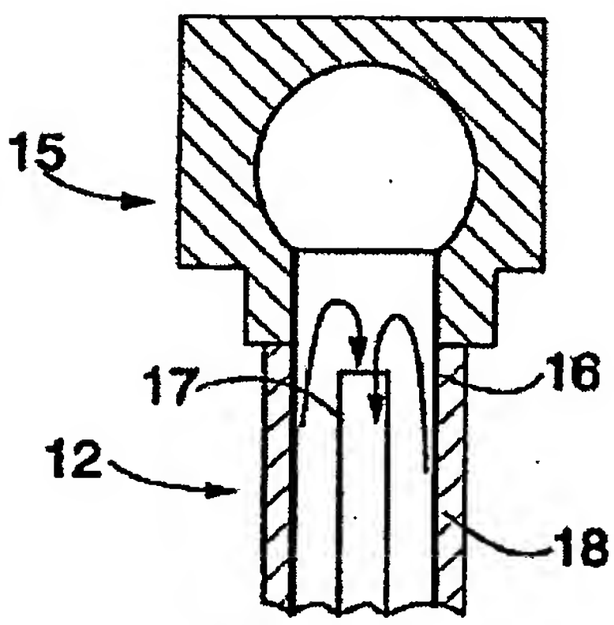

FIG. 2

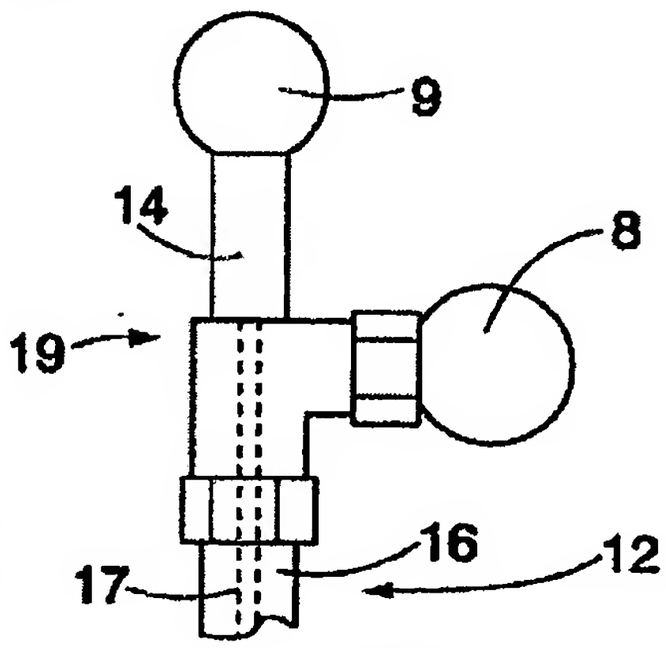

FIG. 3